Application of Palynology to the Determination of the Country-of-Origin of Honey

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Bilateral trade agreements with various countries in the world specify the amount of goods each country can export to the United States. False country-of-origin marking and transshipment of goods from one country to others are some of the ways used by importers/exporters to circumvent the specified quotas, and trade laws and regulations. Therefore, the determination of the country-of-origin is always a challenge for the Customs laboratories.

Common analytical techniques such as trace element analysis, high performance liquid chromatography (HPLC), and differential scanning calorimetry (DSC) have been applied successfully for the determination of the country-or-origin of a number of commodities. However, none of these procedures can be applied to determine the geographical source of production of honey. Based on the success in the application of pollen analysis to other fields such as taxonomy, forensics, as well as honey identification, the Customs Research Laboratory conducted a feasibility study on the application of palynology to determine the country-of-origin of honey.

Forty unprocessed honey samples (10 each) from 4 different countries were included in this study. The honey samples were processed following an acetolysis procedure developed by Dr. John Shane (McCrone Research Institute, Chicago, Illinois) to remove all extraneous matters and isolate the pollen grains to facilitate their morphological study. Basically, sugar and other materials were removed from honey using distilled water and ethanol. The specimens were acetolyzed with a freshly prepared solution of sulfuric acid and acetic anhydride. After centrifugation, the pollen grains were preserved in ethanol following successive rinses with glacial acetic acid and ethanol.

Microscope slides were prepared from the pollen suspension. The pollen contents and morphology were studied using an image analysis system, which includes a polarized light microscope equipped with 40X and 100X lenses. The pollen grains found were stored on the computer to generate a database for future comparison.

The pollen grains found in the samples were very characteristic for each country, indicating that pollen analysis can be applied in the determination of the geographical area where the honey was produced. This is an on-going study; the database will be expanded, as more samples from other countries become available.